0072712

WCH-157
Rev. 0

River Corridor
Closure Contract

Sampling and Analysis Instruction for Borehole Sampling at 118-B-1 Burial Ground

March 2007

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor

WCH
Washington Closure Hanford

WCH-157
Rev. 0

River Corridor
Closure Contract

Sampling and Analysis Instruction for Borehole Sampling at 118-B-1 Burial Ground

March 2007

Author:

W. S. Thompson

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor

DOCUMENT CONTROL 4/2/07 DD

WCH-157
Rev. 0
OU: 100-BC-2
TSD: N/A
ERA: N/A

STANDARD APPROVAL PAGE

Title: Sampling and Analysis Instruction for Borehole Sampling at 118-B-1 Burial Ground

Author Name: W. S. Thompson, Sample Design and Cleanup Verification

Approval: D. N. Strom, Field Remediation Manager

Signature 3/27/07
Date

The approval signatures on this page indicate that this document has been authorized for information release to the public through appropriate channels. No other forms or signatures are required to document this information release.

WCH-157
Rev. 0
OU: 100-BC-2
TSD: N/A
ERA: N/A

CONCURRENCE PAGE

Title: Sampling and Analysis Instruction for Borehole Sampling at 118-B-1 Burial Ground

C. Smith, Project Manager
U.S. Department of Energy, Richland Operations Office

3/28/07

Signature Date

D. A. Faulk, Project Manager
U.S. Environmental Protection Agency

3/28/07

Signature Date

TABLE OF CONTENTS

APPENDICES

FIGURES

TABLES

REVISION HISTORY

Revision	Date	Reason for revision	Revision initiator
Rev. 0	03/07	Initial issuance	N/A

ACRONYMS

ACM	asbestos containing material
BCM	bank cubic meter
CFR	*Code of Federal Regulations*
COC	contaminant of concern
ERDF	Environmental Restoration Disposal Facility
ESD	Explanation of Significant Difference
FH	Fluor Hanford, Inc.
ICP	inductively coupled plasma
QA	quality assurance
QC	quality control
ROD	Record of Decision
RPM	Remedial Project Manager
SAI	sampling and analysis instruction
WCH	Washington Closure Hanford

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			**Volume**		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries

1.0 INTRODUCTION

The Washington Closure Hanford (WCH) Field Remediation Project has removed all of the disposed materials and contaminated soil from the 118-B-1 Burial Ground with the exception of tritium-contaminated soil that is believed to extend from the bottom of the present excavation to groundwater and is believed to contribute to tritium contamination observed at down-gradient monitoring Well 199-B8-6. This sampling and analysis instruction (SAI) provides the requirements for sample collection and laboratory analysis for characterization of the vertical distribution of tritium contamination in the vadose zone soil below the 118-B-1 Burial Ground remedial action excavation. The activities include drilling a characterization borehole, sampling the vadose zone soil and upper saturated zone soils at approximately 1.5-m (5-ft)-intervals, collecting a water sample below the top of the water table in the unconfined aquifer, obtaining physical properties measurements for inputs to modeling activities, and analyzing the samples for tritium.

This section provides background information about the project, a summary of the results from previous investigations, a list of the contaminants of concern (COCs), and a definition of the problem.

1.1 BACKGROUND

Remediation of the 118-B-1 Burial Ground began in March 2004. A total of 28 burial grounds were used in the 100 Area of the Hanford Site for direct burial of solid low-level radioactive waste associated with reactor operations. Seven of these specifically supported reactor operations and are considered primary burial grounds (WHC 1987). This section provides a description of the 118-B-1 Burial Ground and a summary of the Tritium Separation Program, also known as the P-10 Project, which was a source of the tritium contamination observed in the demolition debris and soil removed during remediation of the 118-B-1 Burial Ground.

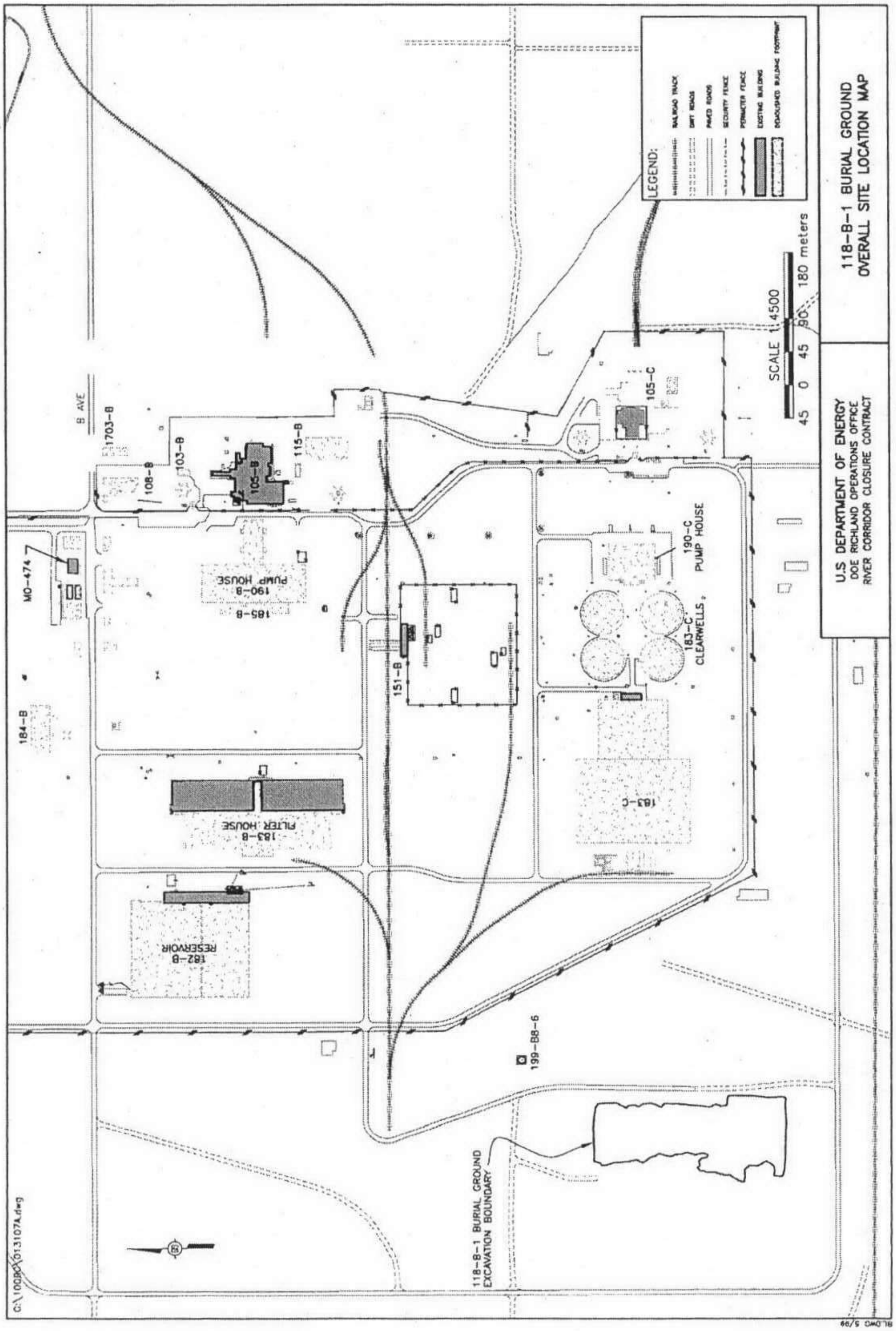
1.1.1 Site Location and Description

The 118-B-1 Burial Ground was the primary burial ground for 105-B Reactor wastes, but also received waste from the 100-N Reactor and the Tritium Separation Program (P-10 Project). The 118-B-1 Burial Ground has also been referred to as the 105-B Burial Ground, the 105-B Solid Waste Burial Ground, and the Operations Solid Waste Burial Ground.

The 118-B-1 Burial Ground is located in the southwestern portion of the 100-B/C Area, approximately 914 m (3,000 ft) west of the 105-C Reactor Building (Figure 1). The original 118-B-1 Burial Ground measured 152 m (500 ft) long by 49 m (160 ft) wide by 6.1 m (20 ft) deep. After approximately three extensions during its operating lifetime from 1944 to 1973, the size of the 118-B-1 Burial Ground increased to 305 m (1,000 ft) long by 98 m (321 ft) wide by 6.1 m (20 ft) deep (DOE/RL 2001).

The original burial ground contained six to eight trenches that ran in an east-west direction, receiving general reactor waste from the B Reactor that included aluminum tubes, lead bricks, thermocouples, vertical and horizontal aluminum thimbles, stainless-steel gun barrels, and expendables such as plastic, wood, and cardboard. Spline silos were also located in the burial ground and were constructed of 3 m to 3.7 m (10 ft to 12 ft) diameter metal culverts. These

Figure 1. Location of the 118-B-1 Burial Ground.



silos were presumably built to receive reactor poison splines and other metal wastes. There were three spacer pits shored with railroad ties located in the burial ground. An extension of the burial ground was constructed to the south of the original burial ground in 1950 and was known as the 108-B Solid Waste Burial Ground, measuring 46 m (150 ft) long by 73 m (240 ft) wide by 6.1 m (20 ft) deep. This extension consisted of three trenches oriented in an east-west direction that contained contaminated tritium pots, irradiated process tubing, contaminated fuel spacers, solid tritium waste, and high-level liquid tritium wastes that were sealed in a 7.6-cm (3-in.) diameter iron pipe. A second extension of the burial ground was added in 1956 along the west side of the original burial ground and was referred to as the "extension to Burial Ground No. 1." It measured 61 m (200 ft) long by 15 m (50 ft) wide and ran in a north-south direction, adjacent to and at the midpoint of the original burial ground's west side. This extension contained two trenches that ran in a north-south direction and was used for the burial of contaminated yokes from the B Reactor. The third burial ground extension was added to the north side of the original burial ground in the mid 1960s and measured 106 m (350 ft) long by 91 m (300 ft) wide, with trenches oriented in an east-west direction. The contents of the third extension included general reactor and construction waste from modifications to the B Reactor.

1.1.2 Tritium Separation Program

The tritium used in the first hydrogen bomb tested at the Pacific Proving Grounds on October 31, 1952, was produced at the 100-B Area of the Hanford Site. In the spring of 1949, a special pilot program for the production and separation of tritium was moved from the Argonne National Laboratory (an Atomic Energy Commission site in Illinois) to the 100-B Facility at Hanford. The project operated intermittently between 1949 and 1955 and was code-named the P-10 Project, as tritium gas was to be a key component in hydrogen weapons, then under top secret development (BHI 1996).

Tritium was produced from irradiated lithium-aluminum fuel targets, after previous experiments with lithium-fluoride slugs had caused "pile irradiation difficulties." The internal components of the lithium-aluminum fuel targets were manufactured off site, but they were jacketed in an un-bonded aluminum-silicon can in the Hanford Works 313 Metal Fabrication Building. In the reactors, these slugs were surrounded by highly enriched uranium "driver" elements. In the P-10 program, irradiation took place in the 105-B, 105-H, and 105-F Reactors. The irradiated fuel targets were placed in special vacuum casks and taken to the 104-B-2 Tritium Laboratory where they were put into special storage wells. The vacuum casks were then moved to the 108-B Tritium Separation Facility and charged into a furnace with an inert atmosphere and a stainless-steel furnace tube connected to a complex series of glass tubing and flasks fitted with palladium valves. As soon as the furnace was charged, the entire line was pumped down to an extremely high vacuum to remove impurities, and the furnace was gassed to drive off absorbent gasses (Gerber 1993). At that point, the actual tritium extraction began, based on the principle that extremely hot palladium allowed diffusion and passage of hydrogen but not of helium and other gasses. The furnace temperature was raised until all of the tritium gas had been driven from the irradiated targets, and the gas was then drawn down the glass lines, through palladium valves, and collected in shipping flasks. These shipping flasks were then stored in storage racks located in the 104-B Tritium Vault, prior to use. There were two tritium campaigns, one using a glass line and later, one using a stainless steel line. A historical photograph of the glass line is provided in Appendix A (Photograph A-1).

Throughout its history, the P-10 Operation was plagued with contamination releases to the environment and to personnel. The primary release mechanism was lost product itself, which simply escaped as gas. Estimates of such tritium releases vary from about 9,000 to 25,000 curie (Ci), to the much higher 7.2 g. The second largest source of contamination emitted from the P-10 operation was the mercury used in the Toepler pumps and pressure gauges. Tritium contamination also was released via particles of broken glass and pieces of metal equipment; through grease and oil that contacted process equipment; via liquid nitrogen that was used in the lost product reclamation mission and in the cold taps of the lines and leak detectors; and through the carbon tetrachloride and other decontaminating agents used to wash down equipment. Additionally, P-10 shipping casks sometimes spread external contamination along travel routes and at the 105-B Wash Pad where they were monitored. Preliminary estimates range from 20,000 to 50,000 Ci, to 16.1 g buried as solid waste, and from 2,500 to 6,000 Ci, to 0.4 g released as cribbed liquid tritium wastes.

R. L. Miller and R. K. Wahlen (WHC 1987) provide estimates of the waste volumes disposed of from the Tritium Separation Program. When the original glass separations line was removed, the components, as well as the waste generated during operation of this line, were buried in the 118-B-1 Burial Ground. The metallic waste generated during operation of the metal line was placed in the 118-B-6 Burial Ground. The estimates (WHC 1987) for waste buried in 118-B-1 that were associated with the glass process line are as follows:

- Spent lithium-aluminum alloy 37,500 lbs
- Lead from pots 30,000 lbs
- Mercury from disposal of glass line 2,000 lbs
- Glass from glass line 2,500 lbs
- Aluminum cladding 3,000 lbs
- Palladium trace amount

1.2 PREVIOUS INVESTIGATIONS

In February 1975, a radiological characterization program was initiated that included locating and reviewing historical records of past solid and liquid waste disposal activities in the 100 Area. Drilling and sampling of selected cribs, trenches, retention basins and the 118-B-1 Burial Ground was performed in order to support development of radionuclide inventories and concentrations in the retired 100 Area radioactive liquid and solid waste disposal facilities, leakage areas, reactors, and associated facilities. The results of this program are reported by J. J. Dorian and V. R. Richards in UNI 1978. Fourteen sample boreholes were drilled into the trenches in the 118-B-1 Burial Ground as part of this study in April 1976. Figure 2 is a diagram showing the location of these boreholes in relation to the 118-B-1 Burial Ground waste disposal trenches.

A geophysical survey of the 118-B-1 Burial Ground was performed in 1993. The purpose of this investigation was to locate primary concentrations of buried waste and possibly determine trench locations. Ground-penetrating radar and electromagnetic induction were used, with 22 zones identified as containing high concentrations of debris (Bergstrom et al. 1993). Figure 3 provides a schematic of the geophysical survey results.

In 1994, a treatability investigation was approved by the EPA, and performed to evaluate the feasibility of excavating, analytical screening, and handling waste materials from the 118-B-1

Figure 2. Location of Boreholes Drilled in 1976 at 118-B-1 Burial Ground.

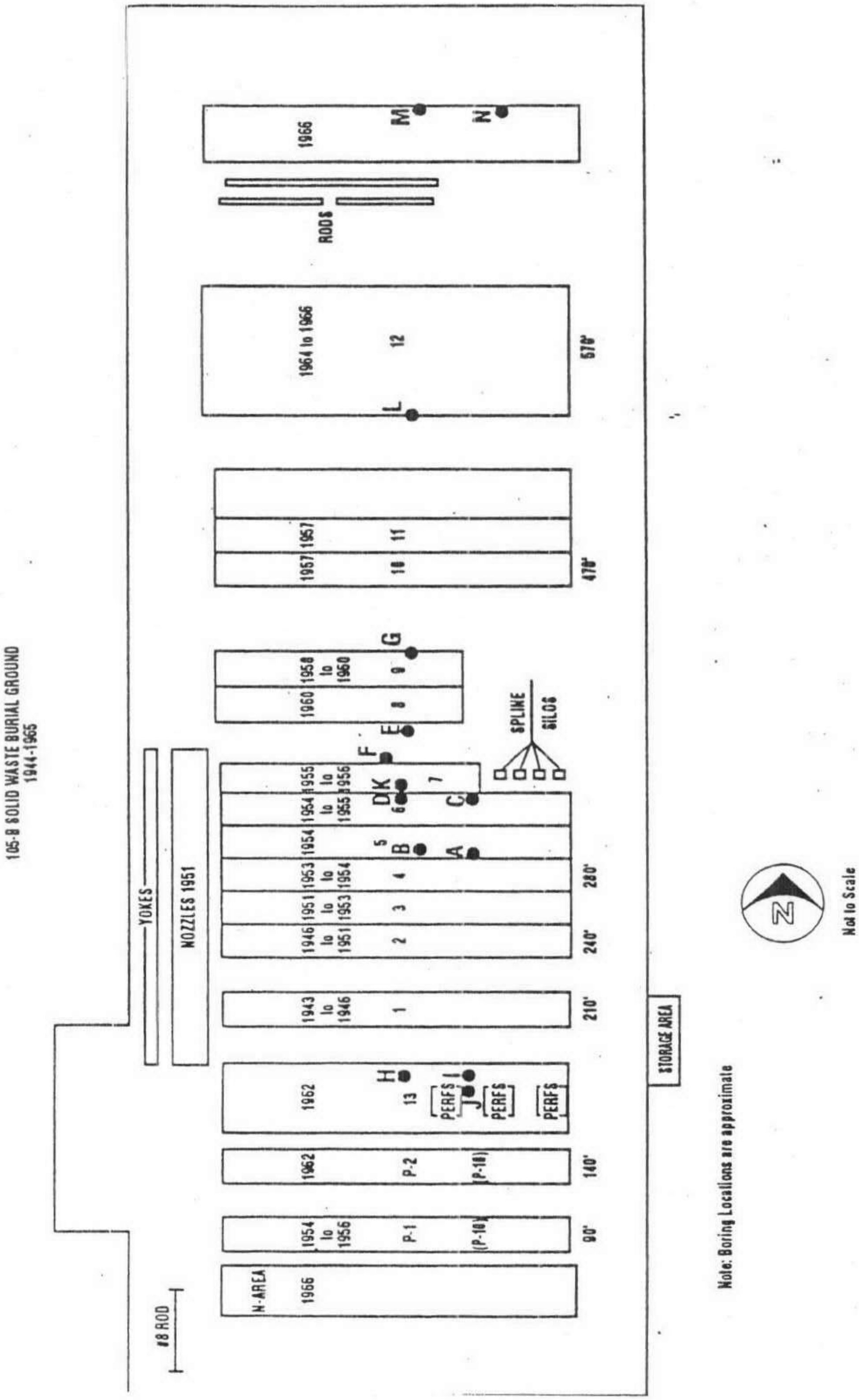
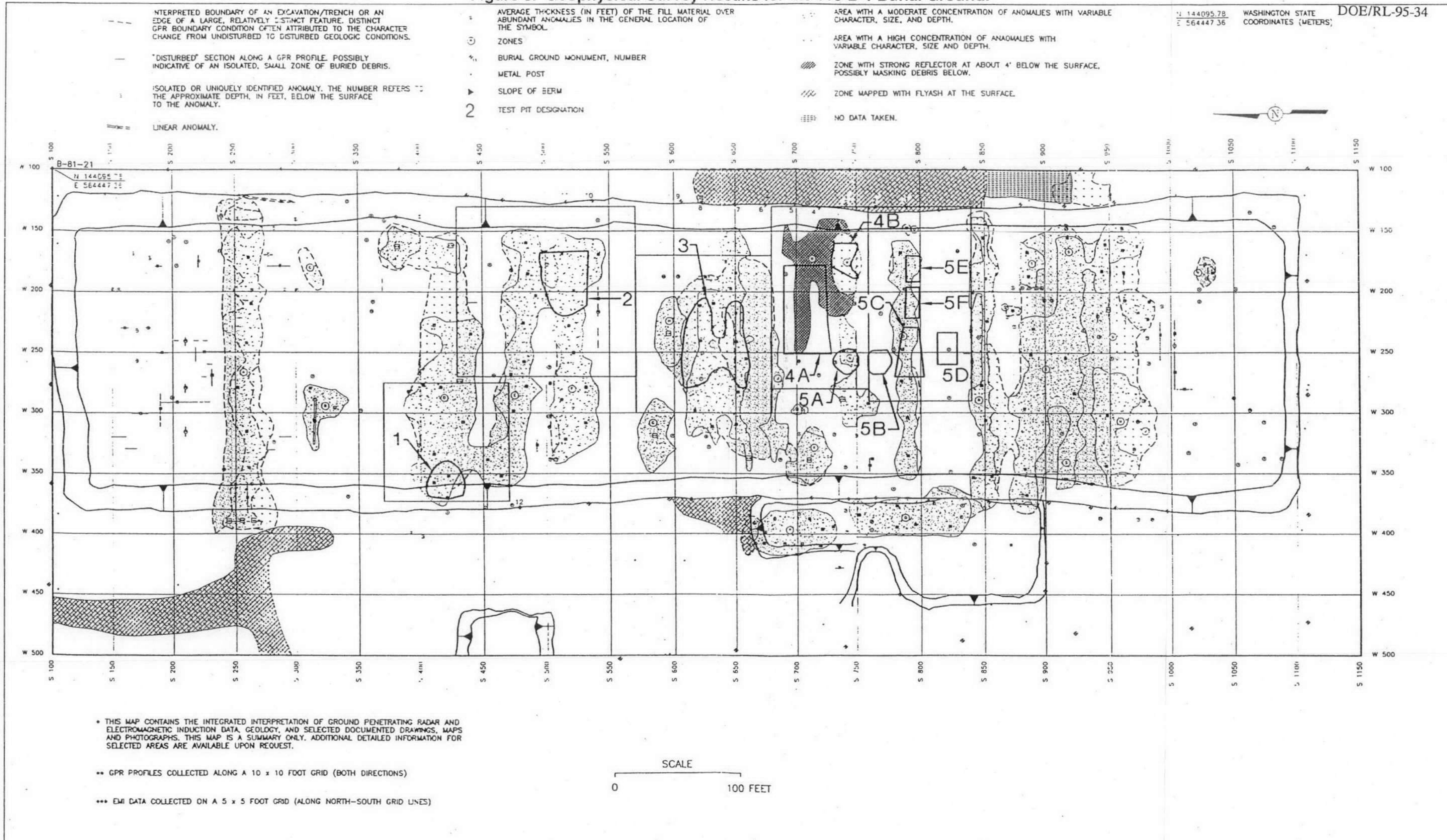


Figure 3. Geophysical Survey Results for the 118-B-1 Burial Ground.



Burial Ground. The results of the study were used to support development of the Proposed Plan and Record of Decision, which would identify the approach to be used for burial ground remediation and provide specific engineering information for removal and disposal of waste generated from the 100 Area removal actions. Five test pits were excavated in various trenches within the burial ground with the results of the study reported in DOE-RL 1995. A large variety of debris and contaminated items were unearthed, including: reactor hardware, splines, perfs, lead sheeting, plastic, wood, filters, wire, concrete, graphite, bottles, lead/cadmium poison pieces, and other scrap materials. Figure 3 shows the locations of the test pits that were excavated.

1.3 REMEDIAL ACTION ACTIVITIES

Remedial activities for the 118-B-1 Burial Ground started on February 2, 2004 with overburden removal. Approximately 20,010 bank cubic meters (BCMs) of overburden was removed. On March 16, 2004, excavation and sorting of contaminated material from the burial ground was initiated.

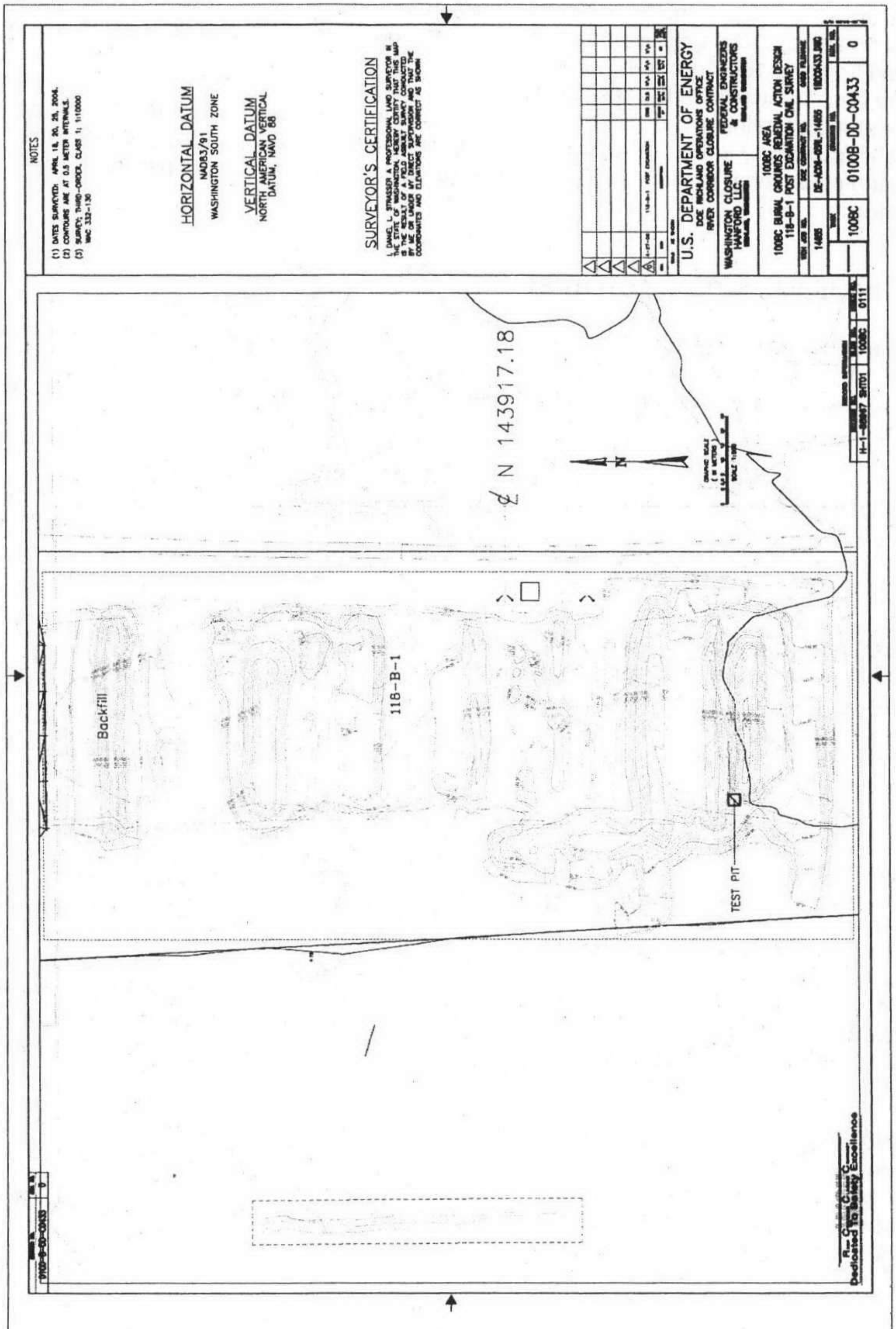
Suspect spent nuclear fuel was discovered during the waste debris sorting operation on September 15, 2004. It was later characterized and confirmed to be spent nuclear fuel. All remedial activities associated with the burial ground were suspended until the Authorization Basis could be properly assessed.

On April 11, 2005, the 100-BC Project was able to re-establish load-out operations on previously sorted and segregated material; however, excavation remained suspended. Excavation, sorting, and load-out activities were resumed on August 24, 2005. With the exception of the mercury-contaminated soil in Trench 23, excavation, sorting, and load-out activities were completed on July 5, 2006. In total, 155,000 tons of waste and contaminated soil from the 118-B-1 Burial Ground was disposed of at the Environmental Restoration Disposal Facility (ERDF).

Visual observations identified that the following waste forms were disposed in 118-B-1 during its operation: nearly 1,000 tritium tubes, 81 mercury tube containers equaling 940 kg (2,072 lbs) of mercury (Hg), several thousand perfs and spacers, spline cases, piping and tubing, miscellaneous metal, tritium furnaces, approximately 350 barium desiccant tubes, wax, lead items, mineral oil, reactor parts and hardware, spent nuclear fuel, hydraulic hoses and parts, degraded personal protective equipment, glassware, compressed gas cylinders, 2-4-D (herbicide) in Trench 21, asbestos containing material (ACM) (friable and non-friable), mercury tubes with solvent base liquid, gaskets with polychlorinated biphenyls, metal lathe turnings (suspected zirconium), dried paints, tars, electrical components, suspect pipe joint compound, and other miscellaneous debris.

Nearly 1,500 anomalies were discovered during the excavation and sorting at 118-B-1 Burial Ground. Of these, approximately 1,000 were tritium tubes, 350 were barium desiccant tubes, 81 were mercury containers, 50 were glass/plastic bottles, and 40 were "one-of-a-kind" anomalous containers. Photos of some of these articles are provided in Appendix A. Figure 4 provides a map of the post-excavation civil survey for the 118-B-1 Burial Ground.

Figure 4. Post-Excavation Civil Survey Map for the 118-B-1 Burial Ground.



1.4 SITE CLOSEOUT SAMPLING

Gridded radiological surveys were performed within the area of contamination, trenches, overburden, and soil stockpiles throughout remediation of the 118-B-1 Burial Ground. The surveys were used to determine that material removal was complete. A site-specific sample design (WCH 2006) was prepared to implement the requirements of the *100 Area Burial Grounds Remedial Action Sampling and Analysis Plan* (DOE-RL 2001) for collection of soil verification samples. Using historical information and field observations of the types of waste forms that were removed from the trenches, the site was stratified into seven sampling areas, not including the staging-pile area and the overburden/below-cleanup-level soil stockpile area. These sample areas are shown in Figure 5 and are described as follows:

- Area 1: Includes trenches 2 through 4. The waste observed included general debris, perfs, spacers, sand-blast material, gearbox, compressed gas cylinders, small glass containers, mercury tubes, tritium tubes, asbestos, barium desiccant tubes, splines, and spent nuclear fuel.

- Area 2: Includes trenches 5 through 8. The waste observed included general debris, perfs, spacers, and tritium pots/furnaces.

- Area 3: Includes trenches 9 through 20. The waste observed included general debris, perfs, spacers, tritium pots/furnaces, small glass containers, mercury tubes, tritium tubes, wax, metal shavings, and a lead lined cask.

- Area 4: Includes trench 21. The waste observed included general debris, perfs, spacers, ink, small glass containers, gearbox, 2,4-D, barium desiccant tubes, silver slag, and a small cylinder.

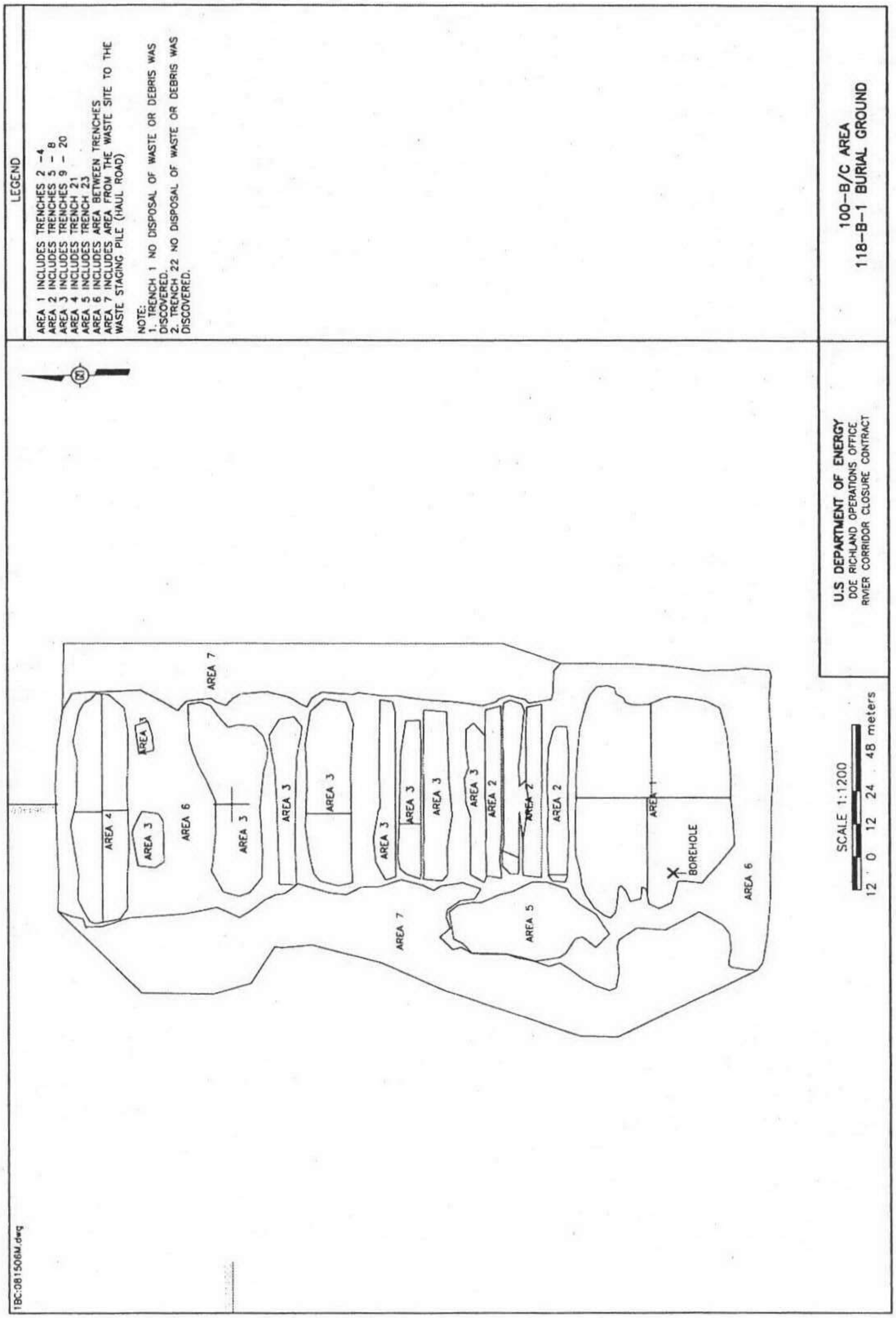
- Area 5: Includes trench 23. The waste observed included steel railing, a deteriorated drum containing oil, and mercury.

- Area 6: Includes the area between the trenches.

- Area 7: Includes the area of the haul roads between the burial ground area and the staging pile areas.

Verification soil samples were collected in July 2006 for Areas 1, 2, 3, 4, 6, and 7. Verification soil samples for Area 5 were collected in November through December 2006. The samples were submitted for analysis of the COCs as specified in the *Site Specific Instruction for Close-out Approach for 118-B-1* (WCH 2006). The laboratory results were reviewed and indicated that residual tritium was present in certain areas and exceeded the soil remedial action goals for tritium. Tritium was detected in verification soil samples collected from Areas 1, 2, 3 and 6. Appendix B provides figures showing sample locations for each of the six sample areas and a summary of the laboratory analytical results for tritium for each of the six areas.

Figure 5. Sample Areas for 118-B-1 Burial Ground.



A review of the verification soil sample results indicates that residual tritium is present in the soil exceeding the cleanup criteria and at levels that would impact groundwater. The highest tritium sample result (239 pCi/g) was located in area "A2" of Sample Area 1 (see Appendix B). In order to further evaluate this elevated result, a discrete soil sample was collected on September 7, 2006, at each of the four individual sample nodes (A2-3, A2-6, A2-7 and A2-15) that contributed to the single composited verification sample result. Tritium was not detected in two of the sample nodes: A2-7 and A2-15. Sample node A2-3 had the highest value, 494 pCi/g, with sample node A-6 having 106 pCi/g. In order to evaluate the vertical distribution of tritium, a pothole was excavated at sample node A2-3 in Sample Area 1. Soil samples were collected at 1.5 m (5 ft) intervals for analysis of tritium. The results of this sampling indicated higher level of tritium present below the base of the remediation, with a maximum of 37,500 pCi/g found at a depth of approximately 6.7 m (22 ft) below the original grade. As a result, an additional seven potholes were excavated at other sample nodes located in Sample Areas 2 and 3 that exhibited elevated tritium in the verification soil sample results. The laboratory results for the tritium pothole sampling activity are summarized in Table 1. Figure 6 shows the locations of these potholes and a summary of the tritium activities in the samples that were collected.

Table 1. Summary Of Pothole Tritium Results (2 pages).

Area 1: Sample Node A2-3		
Sample Number	**Depth below grade (ft)**	**Tritium (pCi/g)**
J13DK7	20	494
J13H32	23	37500
J13H33	26	36300
J13H34	29	33400
J13HN8	34	29000
J13HN9	39	15800
J13HP0	44	19100
J13HP1	49	23800

Area 2: Sample Node A2-3		
Sample Number	**Depth below grade (ft)**	**Tritium (pCi/g)**
J13VM3	23	0.298 (U)
J13VM4	26	0 (U)
J13VM5	29	0 (U)
J13VM6	44	1.06 (U)

Area 2: Sample Node A2-6		
Sample Number	**Depth below grade (ft)**	**Tritium (pCi/g)**
J13VL9	17	448
J13VM0	20	228
J13VM1	23	199
J13VM2	39	18.3

Area 2: Sample Node A2-7		
Sample Number	**Depth below grade (ft)**	**Tritium (pCi/g)**
J13VL1	17	306
J13VL2	20	3370
J13VL3	23	19700
J13VL4	36	6350
J13VL1	17	306

Area 2: Sample Node A2-15		
Sample Number	**Depth below grade (ft)**	**Tritium (pCi/g)**
J13VL5	15	10300
J13VL6	18	11600
J13VL7	21	24700
J13VL8	34	16200
J13VL5	15	10300

Area 3: Sample Node A4-3		
Sample Number	**Depth below grade (ft)**	**Tritium (pCi/g)**
J13V22	11	15.8
J13V23	14	48.4
J13V24	17	36.6
J13V25	32	6.16
J13V22	11	15.8

Table 1. Summary Of Pothole Tritium Results (2 pages).

Area 3: Sample Node A4-4A		
Sample Number	Depth below grade (ft)	Tritium (pCi/g)
J13V18	8	0 (U)
J13V19	11	0 (U)
J13V20	14	0 (U)
J13V21	30	0 (U)

Area 3: Sample Node A4-4B		
Sample Number	Depth below grade (ft)	Tritium (pCi/g)
J13V26	11	1.58 (U)
J13V27	14	1.46 (U)
J13V28	17	1.72 (U)
J13V29	32	1.13 (U)

Area 3: Sample Node A4-7		
Sample Number	Depth below grade (ft)	Tritium (pCi/g)
J13V30	23	704
J13V31	26	4310
J13V32	29	2230
J13V33	40	484

Area 3: Sample Node A4-12A		
Sample Number	Depth below grade (ft)	Tritium (pCi/g)
J13V14	18	0 (U)
J13V15	21	0 (U)
J13V16	24	0 (U)
J13V17	39	60

Area 3: Sample Node A4-12B		
Sample Number	Depth below grade (ft)	Tritium (pCi/g)
J13V34	18	0.123 (U)
J13V35	21	1.34 (U)
J13V36	24	1.15 (U)
J13VL0	35	2.98

1.5 PROBLEM DEFINITION

Tritium contamination is present in the soil below several areas of the remediated 118-B-1 Burial Ground exceeding the remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (ROD) (EPA 1999) and the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005). RESidual RADioactivity (RESRAD) modeling using laboratory analytical results from soil verification sampling and from pothole sampling indicates that residual tritium will reach groundwater at concentrations exceeding the drinking water standard of 20,000 pCi/L. Additionally, tritium was measured at 28,400 pCi/L in a January 2006 groundwater sample collected from Well 199-B8-6 (Figure 1), located approximately 30 m (100 ft) northeast and down-gradient of the 118-B-1 Burial Ground. Figure 7 shows the tritium distribution in groundwater for 2006 as reported in PNNL 2007. Information concerning the vertical distribution of tritium contamination in the vadose zone beneath 118-B-1 Burial Ground to the groundwater is needed to support preparation of an Explanation of Significant Difference (ESD) to the ROD, invoking balancing factors for leaving residual tritium contamination in place.

1.6 CONTAMINANTS OF CONCERN

For the purpose of this investigation, tritium is the primary contaminant of concern.

Figure 6. Location of Potholes with Tritium Sample Results.

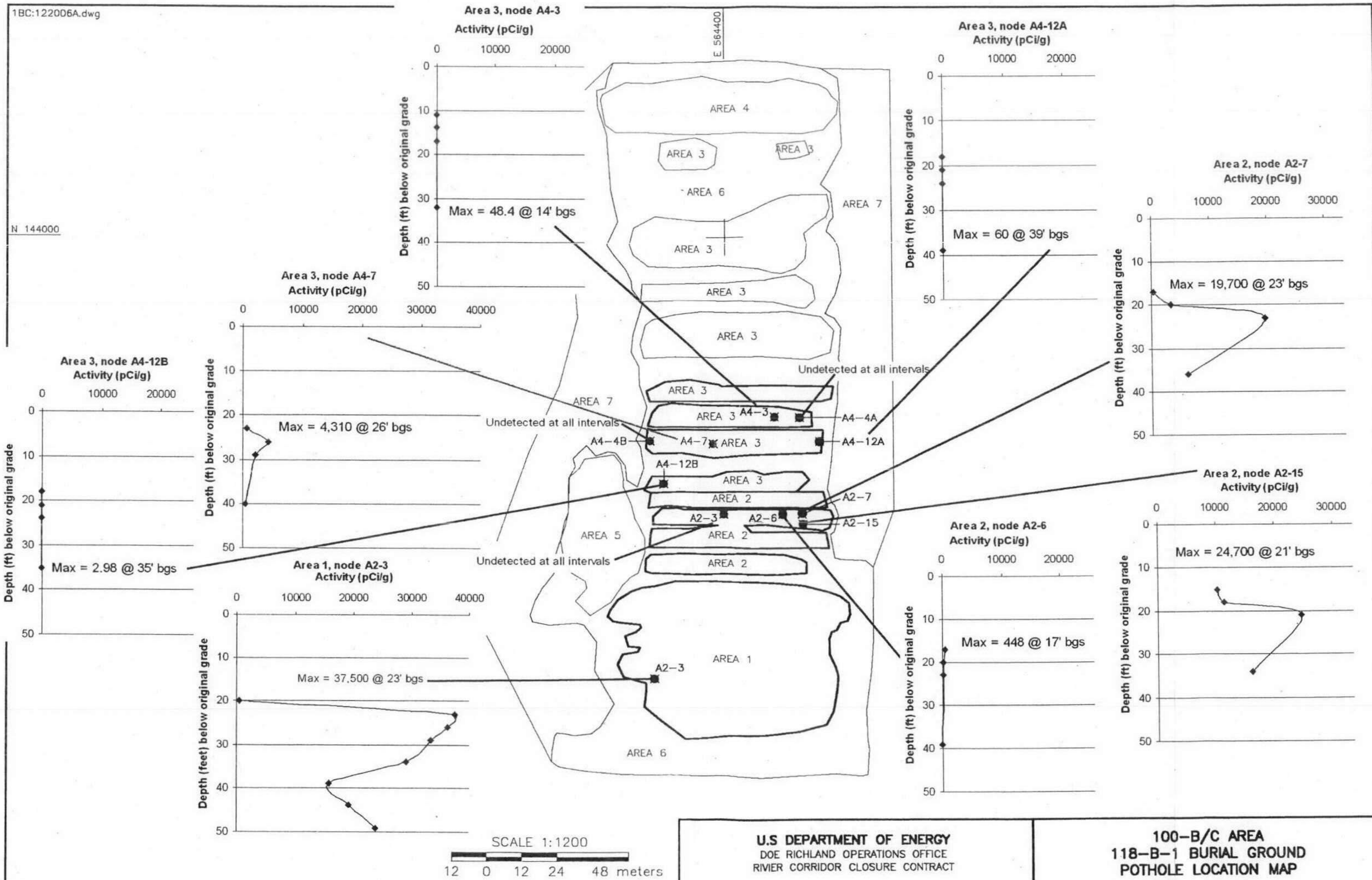
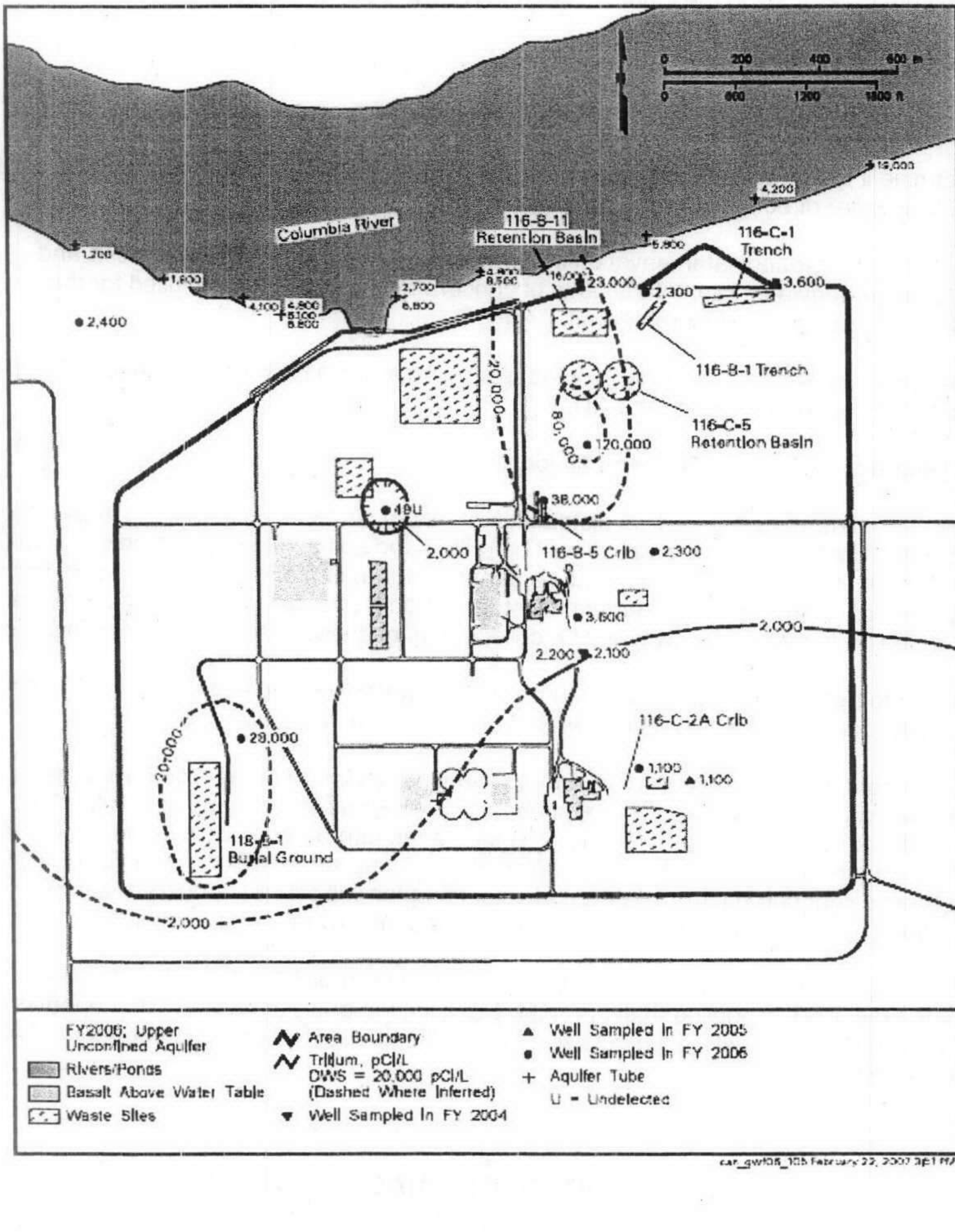


Figure 7. Average Tritium Concentrations in Groundwater (PNNL 2007).



1.7 DECISIONS TO BE MADE

The following subsections present the decisions that need to be made to resolve the problem identified in Section 1.5 and the inputs needed to resolve each decision.

1.7.1 Decision Statements

1. Determine the vertical distribution of tritium contamination at the 118-B-1 Burial Ground.

2. Determine if tritium associated with waste disposal at the 118-B-1 Burial Ground is present in groundwater directly below the burial ground.

3. Determine the groundwater elevation in the vicinity of the 118-B-1 Burial Ground and evaluate groundwater for contaminants of concern and parameters identified for the 100-BC-5 groundwater Operable Unit.

4. Determine vadose zone physical properties specific to the 118-B-1 Burial Ground site to be used in modeling to support the ESD.

1.7.2 Required Inputs for Decision Making

1. In order to determine the vertical distribution of tritium contamination at the 118-B-1 Burial Ground, a characterization borehole will be drilled and soil samples collected at 1.5-m (5-ft) depth intervals. The soil samples will be analyzed for tritium and pH. Limited analysis of physical properties including percent moisture, particle size distribution, bulk density, and saturated hydraulic conductivity will be collected as necessary to support modeling efforts.

2. In order to determine if tritium is present in groundwater, a sample of groundwater from the characterization borehole will be collected and analyzed for tritium.

3. In order to determine the groundwater elevation in the vicinity of the 118-B-1 Burial Ground and evaluate groundwater for contaminants of concern associated with the 100-BC-5 groundwater Operable Unit, the measurement of the depth to groundwater in the borehole will be recorded and groundwater samples will be analyzed for tritium, strontium-90, nitrate, and hexavalent chromium. The groundwater samples will also be analyzed for anions, alkalinity, and general radiochemistry typical of routine groundwater analysis.

4. In order to determine vadose zone physical properties specific to the 118-B-1 Burial Ground site to be used in modeling to support the ESD, limited analysis of physical properties including percent moisture, particle size distribution, bulk density, and saturated hydraulic conductivity will be collected.

2.0 PROJECT MANAGEMENT

This section identifies the individuals or organizations participating in the project and discusses specific roles and responsibilities of the individuals/organizations. The quality objectives for measurement data and the special training requirements for the staff performing the work are also discussed.

Sampling and analysis activities will be performed in accordance with the following requirements:

- DOE Order 414.1A, *Quality Assurance*
- *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations* (EPA 2001)
- *Hanford Analytical Services Quality Assurance Requirements Documents* (DOE-RL 1996).

The sampling and analysis requirements specified in this SAI are consistent with the quality assurance (QA) and quality control (QC) requirements specified in *100 Area Burial Grounds Remedial Action Sampling and Analysis Plan* (DOE-RL 2001).

2.1 PROJECT/TASK ORGANIZATION

This project shall be managed through the WCH Field Remediation Project. Services for drilling and abandonment of the characterization borehole, split-spoon sampling, and groundwater sampling support will be provided by a drilling subcontractor. Borehole geology, selection of split-spoon sample locations, packaging, and shipment of samples, and implementation of this SAI will be performed by a WCH analytical lead/geologist.

2.2 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The required detection limits and the precision and accuracy requirements for each of the analyses to be performed for soil samples and water samples are summarized in Tables 2 and 3, respectively.

Table 2. Analytical Performance Requirements for Soil Samples.

Analytical Method	Analyte	Action Level[a]		RDL Requirement	Accuracy (% Recovery)	Precision (% RPD)
		Direct Exposure	Groundwater/ River Protection			
Liquid scintillation	Tritium	510 pCi/g	15.8/106.1 pCi/g[b]	10 pCi/g	70-130	± 30
EPA Method 9045	Corrosivity (pH)	N/A	N/A	0.1 pH unit	70-130	± 30
ASTM D2216-92	Moisture content	N/A	N/A	N/A	N/A	N/A
ASTM D2937[c]	Bulk density	N/A	N/A	N/A	N/A	N/A
ASTM D422-63[c]	Particle-size distribution	N/A	N/A	N/A	N/A	N/A
ASTM D2434-68[c]	Saturated hydraulic conductivity	N/A	N/A	N/A	N/A	N/A

[a] Action levels are specified in DOE/RL 2005.
[b] Concentration in soil based on achieving the groundwater and river protection remedial action goal of 20,000 pCi/L.
[c] One soil sample at a depth below 18.2 m (60 ft) will be selected and submitted for analysis of bulk density, particle-size distribution, and saturated hydraulic conductivity.
ASTM = American Society of Testing and Materials
NA = not applicable
RDL = required detection limit
RPD = relative percent difference

Table 3. Analytical Performance Requirements for Water Samples.

Analytical Method	Analyte	Groundwater Action Level[a]	RDL Requirement	Accuracy (% Recovery)	Precision (% RPD)
Gamma energy analysis	Cesium-137	60 pCi/L	15 pCi/L	80-120	± 20
	Cobalt-60	100 pCi/L	25 pCi/L	80-120	± 20
	Europium-152	200 pCi/L	50 pCi/L	80-120	± 20
	Europium-154	60 pCi/L	50 pCi/L	80-120	± 20
	Europium-155	600 pCi/L	50 pCi/L	80-120	± 20
Gross alpha	Gross alpha activity	NS	3 pCi/L	80-120	± 20
Gross beta	Gross beta activity	NS	4 pCi/L	80-120	± 20
Tritium	Tritium	20,000 pCi/L	30 pCi/L	80-120	± 20
Total radioactive strontium	Strontium-90	8 pCi/L	2 pCi/L	80-120	± 20
EPA Method 300.0	Bromide	NS	250 µg/L	80-120	± 20
	Chloride	NS	200 µg/L	80-120	± 20
	Fluoride	NS	500 µg/L	80-120	± 20
	Nitrate	NS	250 µg/L	80-120	± 20
	Nitrite	NS	250 µg/L	80-120	± 20
	Phosphate	NS	500 µg/L	80-120	± 20
	Sulfate	250,000 µg/L	500 µg/L	80-120	± 20
EPA Method 353.1	Nitrate/nitrite	NS	75 µg/L	80-120	± 20
EPA Method 7196	Hexavalent chromium	80 µg/L	10 µg/L	80-120	± 20
EPA Method 310.1	Alkalinity	NS	5000 µg/L	80-120	± 20

[a] Action levels are specified in DOE/RL 2005.
NS = not specified RDL = required detection limit RPD = relative percent difference

2.3 SPECIAL TRAINING REQUIREMENTS

The training or certification requirements needed by personnel are described in BSC-1, *Business Services and Communications*, Procedure 2.4, "Training Requirements" and ENV-1, *Environmental Monitoring & Management,* Procedure 2.36, "River Corridor Quality Assurance Program Plans." Additional training requirements necessary for drilling personnel are specified in the subcontract for drilling services.

3.0 MEASUREMENT/DATA ACQUISITION

This section presents the sampling process design, along with the requirements for sampling methods, sample handling, custody, preservation, containers, and holding times. The requirements for field and laboratory QC, instrument calibration and maintenance, and field documentation are also addressed.

3.1 SAMPLING PROCESS DESIGN

The primary purpose of collecting and analyzing samples from the 118-B-1 Burial Ground characterization borehole is to assess the vertical distribution of tritium in the vadose zone soil below the remedial action excavation to groundwater. This data will be used to refine the conceptual model and support preparation of an ESD to the ROD.

The borehole will be drilled at the location of the pothole where the highest residual tritium in soil analyses was found (at sample node A2-3 in Sample Area 1). Split-spoon sampling will be performed to collect discrete soil samples at 16.7-, 18.2-, 19.8-, 21.3-, 22.8-, 24.4-, and 25.9-m (55-, 60-, 65-, 70-, 75-, 80-, and 85-ft) depths below original ground surface (Figure 8), with an additional sample of saturated soil collected from the unconfined aquifer at the total depth of the borehole. The soil above 15.2 m (50 ft) is backfill material for the original pothole and, therefore, will not be sampled.

Actual sample intervals may vary depending upon depth to groundwater, anticipated to be at approximately 24 m (79 ft) based on a 2005 groundwater level measurement in Well 199-B8-6. Based on the judgment of the analytical lead/site geologist, additional/alternative split-spoon samples may be collected at significant lithologic changes. These samples will be analyzed for tritium, pH, and moisture content (Table 2). If poor sample recovery occurs for a given split-spoon sample interval, the geologist may direct the collection of soil cuttings from the drive barrel for that sample interval. One of the soil samples below 18.2 m (60 ft) will be selected at the discretion of the geologist for additional testing of bulk density, particle size distribution, and saturated hydraulic conductivity to support modeling of residual tritium in the vadose zone.

The borehole will be drilled approximately 3 m (10 ft) into the unconfined aquifer. A static water-level measurement will be recorded by the analytical lead/geologist. In addition to the saturated soil sample, a filtered and unfiltered groundwater sample will be collected. The water samples will be analyzed for the constituents listed in Table 3.

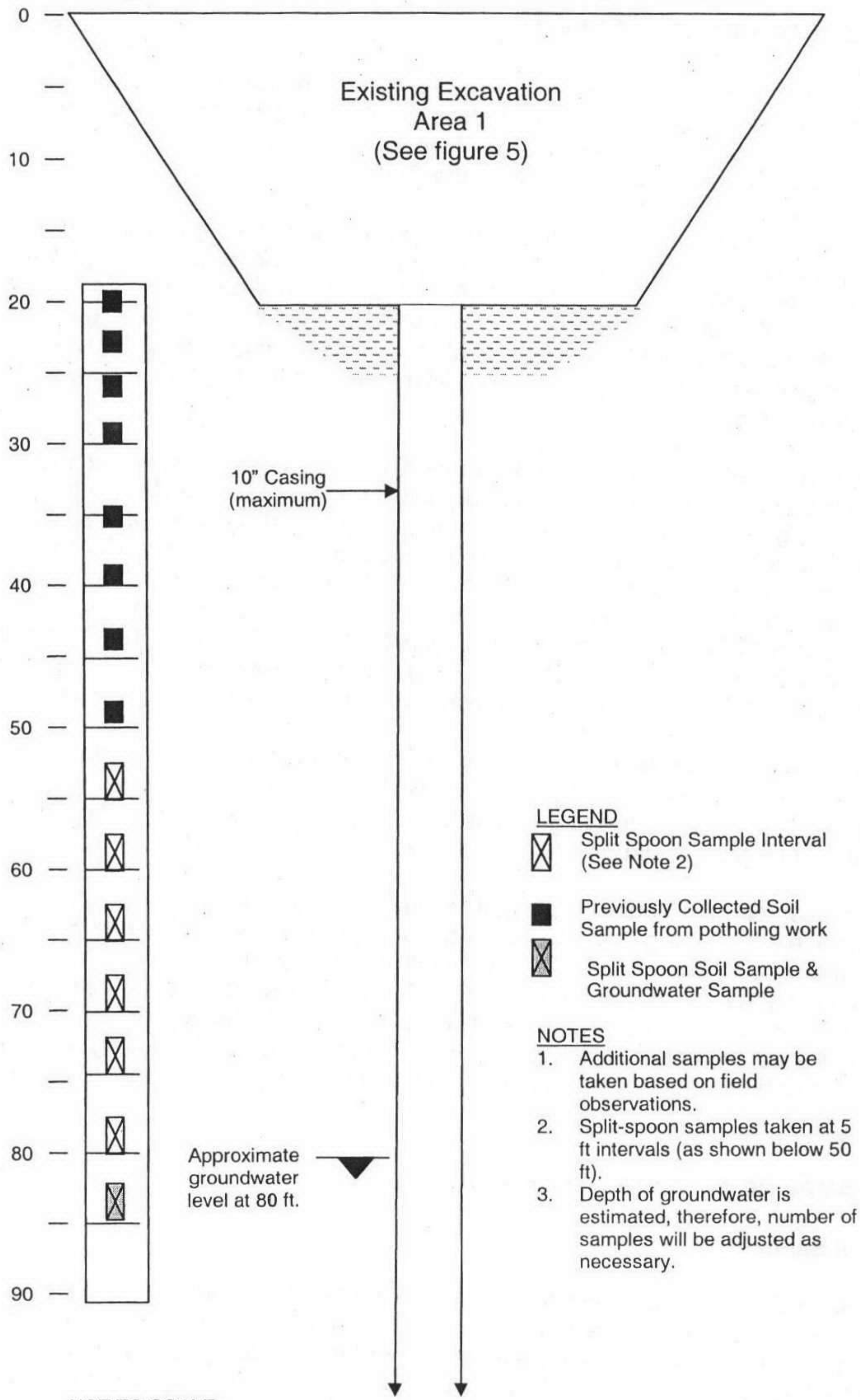
At the completion of drilling and sampling, the borehole may be logged (if casing diameter and drilling schedule allow) using high-resolution spectral gamma-ray and neutron moisture sonde. High-resolution spectral gamma-ray logs are useful to evaluate the vertical distribution and concentration of gamma-emitting radionuclides. Neutron moisture logs are used to assess the vertical distribution of moisture in the soil column at the site. At the completion of all data collection activities, the borehole will be abandoned as specified in the drilling subcontract and in accordance with the requirements specified in *Washington Administrative Code* 173-160.

3.2 SAMPLING METHODS REQUIREMENTS

3.2.1 Soil Sampling

Soil sampling will be performed in accordance with ENV-1, Procedure 2.16, "Soil and Sediment Sampling." Samples will be collected using an 11.43-cm (4.5-in) inner diameter split-spoon sampler equipped with four 15.2-cm (6-in.) long separate stainless steel liners for samples. If insufficient soil is retrieved in the split spoon to satisfy the volumetric requirements for sample analysis, the split spoon may be redriven or additional material retrieved from the drive barrel. An entry will be made in the borehole log and the field logbook identifying the sample collection method and depth intervals. All split-spoon sampling depths will be referenced to the maximum

Figure 8. Characterization Borehole Sample Intervals.



depth that the split spoon is driven. All depths will be recorded to the nearest 0.03 m (0.10 ft). Drilling personnel will not overdrive the sampling device.

The first split-spoon sample interval for the borehole will be collected at an approximate depth of 16.7 m (55 ft), just below the previous pothole sampling. Split-spoon samples will be collected approximately every 1.5 m (5 ft) as shown in Figure 8. The analytical lead/site geologist will use professional judgment and field observations of lithology to adjust sample intervals as needed.

The split spoon sampler and liners will be decontaminated by Fluor Hanford (FH) Nuclear Process Operators before use in accordance with FH's *Groundwater Remediation Project Procedure*, GRP-EE-01-6.2, "Field Cleaning and/or Decontamination of Drilling Equipment."

3.2.2 Groundwater Sampling

Filtered and unfiltered groundwater samples will be collected in accordance with FH's *Groundwater Remediation Project Procedure*, GRP-EE-01-4.1, "Groundwater Sampling," or using equivalent methods. Groundwater sampling equipment, including 0.45 micron filters, will be provided by FH.

3.3 SAMPLE HANDLING, SHIPPING, AND CUSTODY REQUIREMENTS

All sample handling, shipping, and custody should be performed in accordance with ENV-1, Procedure 2.14, "Sample Packaging and Shipping"; Procedure 2.13, "Chain of Custody"; and Procedure 2.17, "Sample Storage and Shipping Facility."

3.4 SAMPLE PRESERVATION, CONTAINERS, AND HOLDING TIMES

The sample preservation, container, and holding time requirements for the analyses to be performed are summarized in Table 4.

Table 4. Sample Preservation, Containers, and Holding Times (2 pages).

Analytical Method	Container	Quantity	Preservative	Holding Time
Soil Samples				
Tritium	Plastic/glass	125 g	None	6 months
pH	Plastic/glass	125 g	None	ASAP
Soil moisture	Moisture tin	125 g	None	30 days
Particle size distribution	Split spoon liner (capped)	2 liners	None	None
Bulk density			None	None
Saturated hydraulic conductivity			None	None
Water Samples (Filtered/Unfiltered)				
GEA	Plastic/glass	1 L	Nitric pH <2	6 months
Gross alpha/beta	Plastic/glass	2 L	Nitric to pH<2	6 months
Anions	Plastic	500 mL	None	28 days/48 hrs
Tritium	Plastic/glass	125 mL	None	6 months
Nitrate/nitrite	Plastic/glass	300 mL	H_2SO_4 to pH<2	28 days

3.8 FIELD DOCUMENTATION

Field documentation shall be kept in accordance with ENV-1, including the following procedures:

- Procedure 2.5, "Field Logbooks"
- Procedure 2.13, "Chain of Custody."

Geologic logging of the borehole and associated documentation will be conducted concurrently with the drilling by the WCH analytical lead/geologist using the FH *Groundwater Remediation Project Procedure*, Procedure GRP-EE-01-7.0, "Geologic Logging" or equivalent documentation.

4.0 ASSESSMENTS AND RESPONSE ACTIONS

The 100 Area Field Remediation Quality Assurance Representative and/or personnel from the Quality Assurance and Services Group may conduct random surveillance and assessments in accordance with QA-1, *Quality Assurance*, Procedure QA-1-1.7, "WCH Surveillances – Internal, Subcontractor, and Other Hanford Contractors." Surveillance/assessment activities may be performed to verify compliance with the requirements outlined in this document, project work packages, the WCH Quality Assurance Program Description, WCH procedures, and regulatory requirements.

Deficiencies identified by surveillances/assessment activities shall be to management and documented in accordance with WCH-QA-1-1.7 and WCH-QA-1.2, "Corrective Action Management." When appropriate, corrective actions will be taken by the project engineer in accordance with the *Hanford Analytical Services Quality Assurance Requirements Document*, Vol. 1, Section 4.0 (DOE-RL 1996), to minimize recurrence.

5.0 DATA VERIFICATION AND VALIDATION REQUIREMENTS

Data verification and validation are performed on analytical data sets primarily to confirm that sampling and chain-of-custody documentation is complete, sample numbers can be tied to the specific sampling location, samples were analyzed within the required holding times, and analyses met the data quality requirements specified in this SAI. All data verification and validation shall be performed in accordance with ENV-1, Procedure 2.5, "Data Package Validation Process"; *Data Validation Procedure for Radiochemical Analysis* (BHI 2001b); and *Data Validation Procedure for Chemical Analysis* (BHI 2001a). For this investigation, data verification will be performed; however, data validation will not be required.

6.0 WASTE MANAGEMENT

Waste generated by sampling activities will be managed in accordance with the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005) and WMT-1, *Waste Management and Transportation.* Unused samples and associated laboratory waste for the analysis will be dispositioned in accordance with the laboratory contract and agreements for return to the Hanford Site. Pursuant to *40 Code of Federal Regulations (CFR) 300.440,* Remedial Project Manager (RPM) approval is required before returning unused samples or waste from offsite laboratories located off the Hanford Site.

Approval of the *100 Area Burial Ground Remedial Action Sampling and Analysis Plan* (DOE-RL 2001) constitutes Remedial Action Project Manager approval for shipment of offsite and onsite laboratory sample waste back to the waste site of origin.

Purgewater resulting from equipment decontamination and groundwater sampling will be managed in accordance with the *Strategy for Handling and Disposing of Purgewater at the Hanford Site, Washington* (DOE-RL 1990).

7.0 HEALTH AND SAFETY

All field operations will be performed in accordance with WCH health and safety requirements, which are outlined in SH-1, *Safety and Health,* and RC-1, *Radiation Protection Procedures.* A site specific health and safety plan and job safety analysis for drilling operations will be prepared by the drilling subcontractor.

The sampling procedures and associated activities will consider exposure reduction and contamination control techniques that will minimize the radiation exposure to the sampling team as required by RC-1 and QA-1, *Quality Assurance.*

8.0 REFERENCES

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations,* as amended.

ASTM, 2002, *Standard Test Method for Particle-Size Analysis of Soils,* ASTM D 422-63, American Society for Testing and Materials, Philadelphia, Pennsylvania.

ASTM, 1992, *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock,* ASTM D 2216-92, American Society for Testing and Materials, Philadelphia, Pennsylvania.

ASTM, 2004, *Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method,* ASTM D 2937, American Society for Testing and Materials, Philadelphia, Pennsylvania.

ASTM, 1968, *Standard Test Method for Laboratory Permeability of Granular Soils (Constant Head)*, ASTM D 2434-68, American Society for Testing and Materials, Philadelphia, Pennsylvania.

Bergstrom, K.A., T.H., Mitchell, and A.L. Langstaff, 1993, *Geophysical Investigation of the 118-B-1 Burial, 100 B/C Area, Hanford Site, Washington*, WHC-SD-EN-TI-137, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

BHI, 1996, *Radiological Characterization Survey Methodology and Sampling and Analysis Strategy for the 104-B-1 Tritium Vault and the 104-B-2 Tritium Laboratory*, BHI-0810, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2001a, *Data Validation Procedure for Chemical Analysis*, BHI-01435, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2001b, *Data Validation Procedure for Radiochemical Analysis*, BHI-01433, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BSC-1, *Business Services and Communications*, Washington Closure Hanford, Richland, Washington.

DOE Order 414.1A, *Quality Assurance*, as amended, U.S. Department of Energy, Washington D.C.

DOE-RL, 1990, *Strategy for Handling and Disposing of Purgewater at the Hanford Site, Washington*, Letter No. 90-ERB-076 from R. O. Izatt, U. S. Department of Energy, to Hanford Site Contractors, dated August 21, 1990.

DOE-RL, 1995, *118-B-1 Burial Ground Excavation Treatability Test Report*, DOE/RL-95-34, Rev. 0, U. S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1996, *Hanford Analytical Services Quality Assurance Requirements Documents*, DOE/RL-96-68, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2001, *100 Area Burial Grounds Remedial Action Sampling and Analysis Plan*, DOE/RL-2001-35, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2005, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

ENV-1, *Environmental Monitoring & Management*, Washington Closure Hanford, Richland, Washington.

EPA, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2001, *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations*, EPA QA/R-5, U.S. Environmental Protection Agency, Washington, D.C.

Gerber, M.S., 1993, *Summary of 100-B/C Reactor Operations and Resultant Wastes, Hanford Site*, WHC-SD-EN-RPT-004, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

GRP-EE-01-4.1, *Groundwater Remediation Project Procedure*, "Groundwater Sampling," Fluor Hanford, Inc., Richland, Washington.

GRP-EE-01-7.0, *Groundwater Remediation Project Procedure*, "Geologic Logging," Fluor Hanford, Inc., Richland, Washington.

GRP-EE-01-6.2 *Groundwater Remediation Project Procedure*, "Field Cleaning and/or Decontamination of Drilling Equipment," Fluor Hanford, Inc., Richland, Washington.

PNNL, 2007, *Hanford Site Groundwater Monitoring for Fiscal Year 2006*, PNNL-16346, Pacific Northwest National Laboratories, Richland, Washington.

RC-1, *Radiation Protection Procedures*, Washington Closure Hanford, Richland, Washington.

SH-1, *Safety and Health*, Washington Closure Hanford, Richland, Washington.

QA-1, *Quality Assurance*, Washington Closure Hanford, Richland, Washington.

UNI, 1978, *Radiological Characterization of the Retired 100 Areas*, UNI-946, United Nuclear Industries, Inc., Richland, Washington.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," *Washington Administrative Code*, as amended.

WCH, 2006, *Site Specific Instruction for Close-out Approach for 118-B-1*, CCN #130128, Washington Closure Hanford, Richland, Washington.

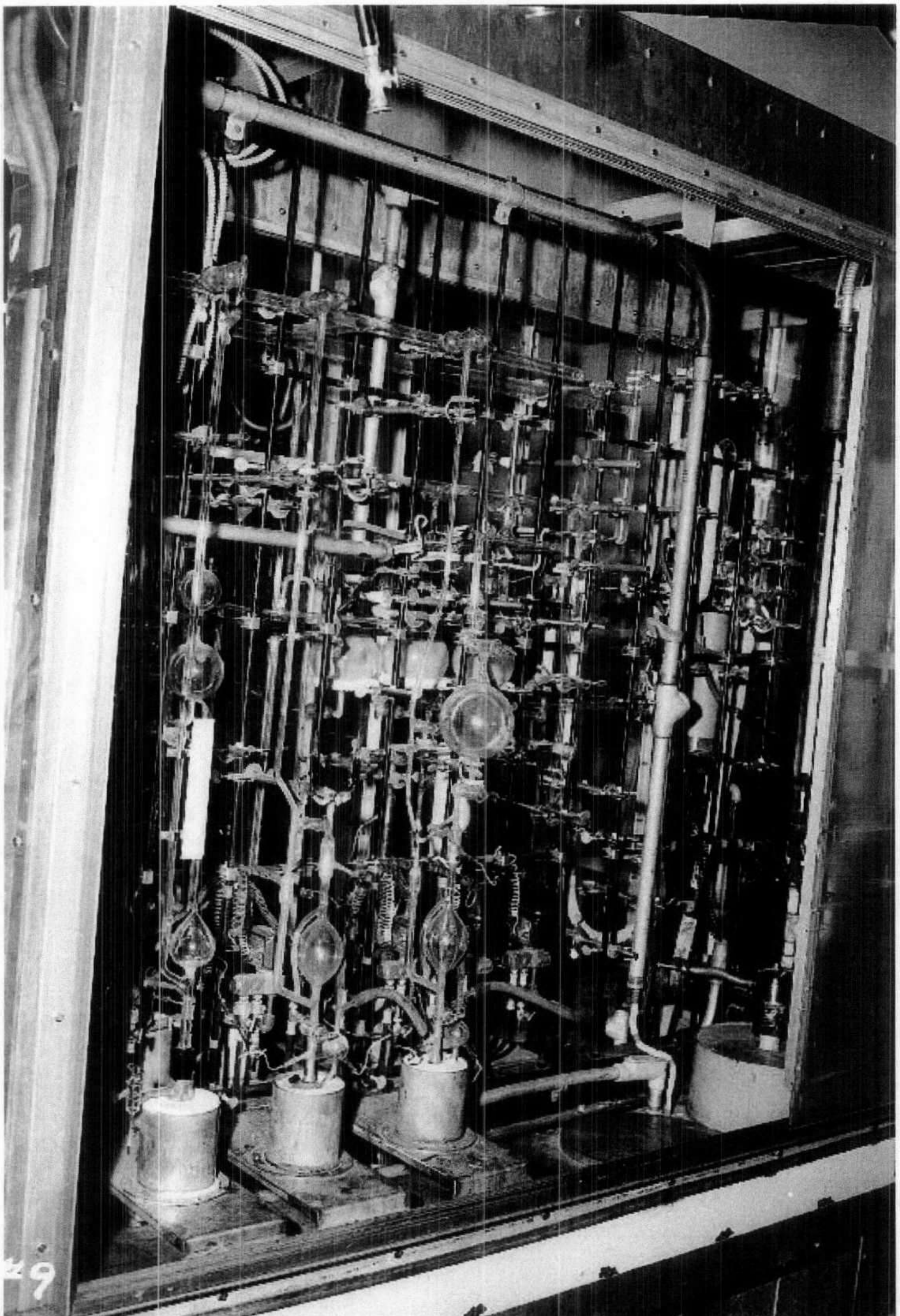
WHC, 1987, *Estimates of Solid Waste Buried in 100 Area Burial Grounds*, WHC-EP-0087, Westinghouse Hanford Company, Richland, Washington.

WMT-1, *Waste Management and Transportation*, Washington Closure Hanford, Inc., Richland, Washington.

APPENDIX A

PHOTOGRAPHS

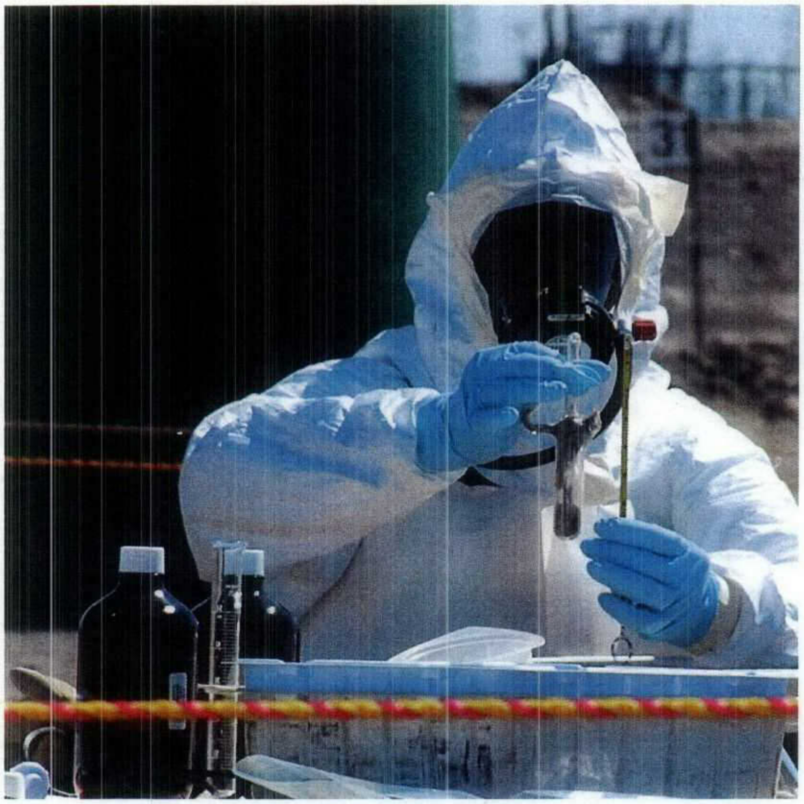
Photograph A-1. P-10 tritium line.



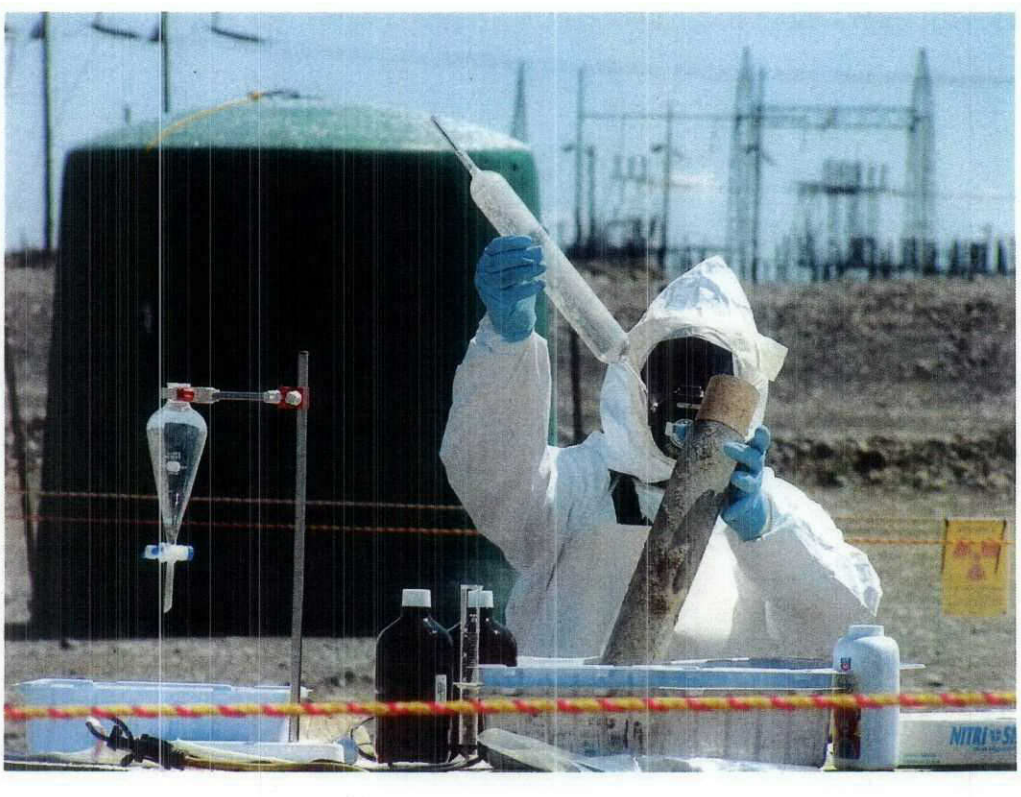
Photograph A-2. Tritium tubes used as shipping casks.

Photograph A-3. Glassware found inside tritium tube.

Photograph A-4. Contents of tritium tube.

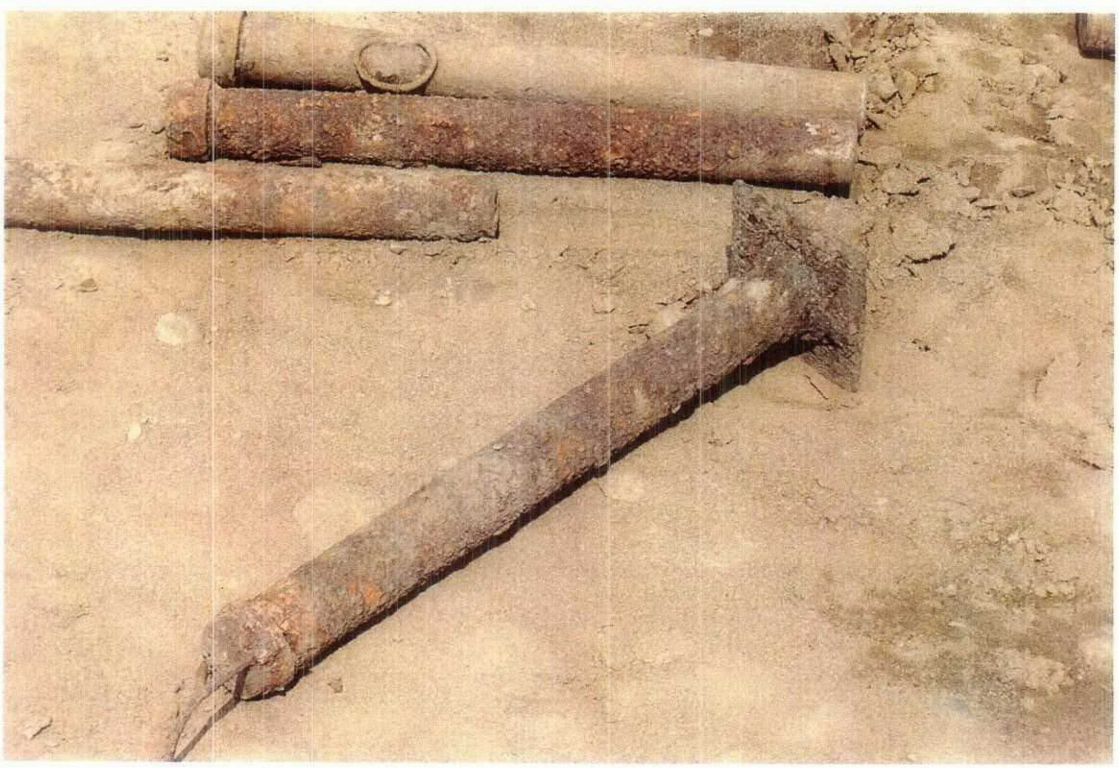


Photograph A-5. Glassware removed from inside cardboard packing tritium tube.



Photograph A-6. Mercury tubes.

Photograph A-7. Mercury tubes.



Photograph A-8. Mercury tubes and tritium tubes.

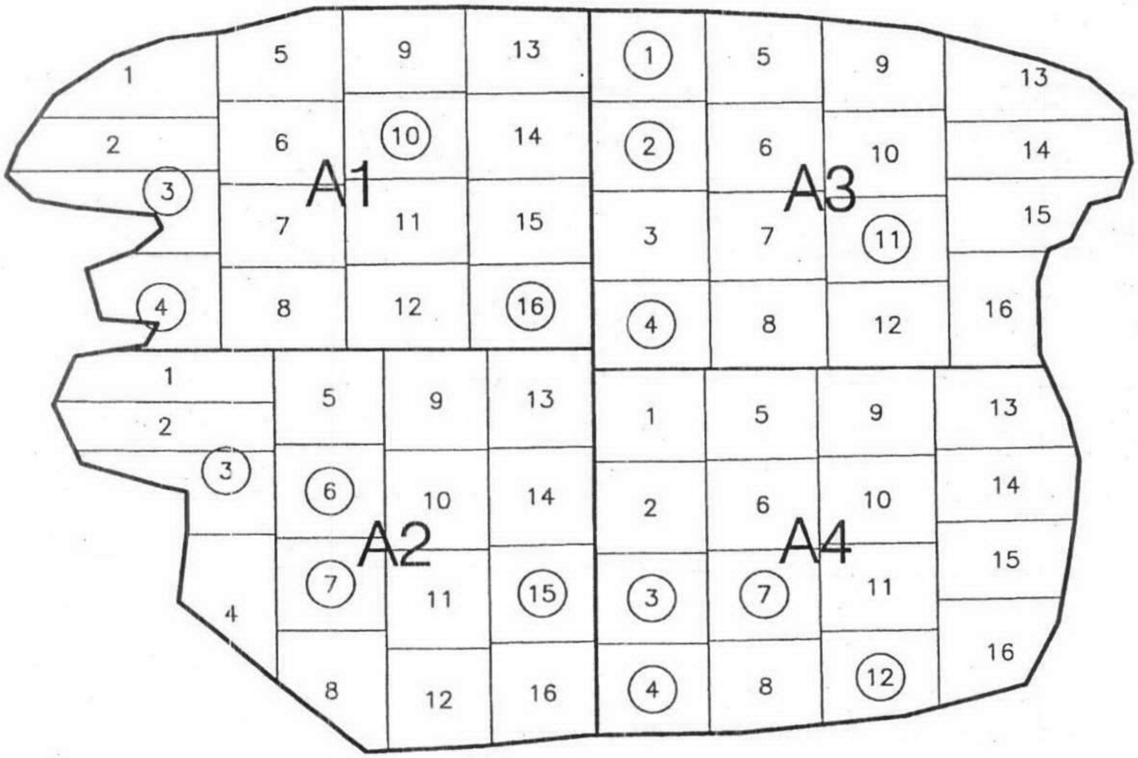
Photograph A-9. Approximately 350,000 perfs and spacers.

Photograph A-10. Tritium furnace pots.

APPENDIX B

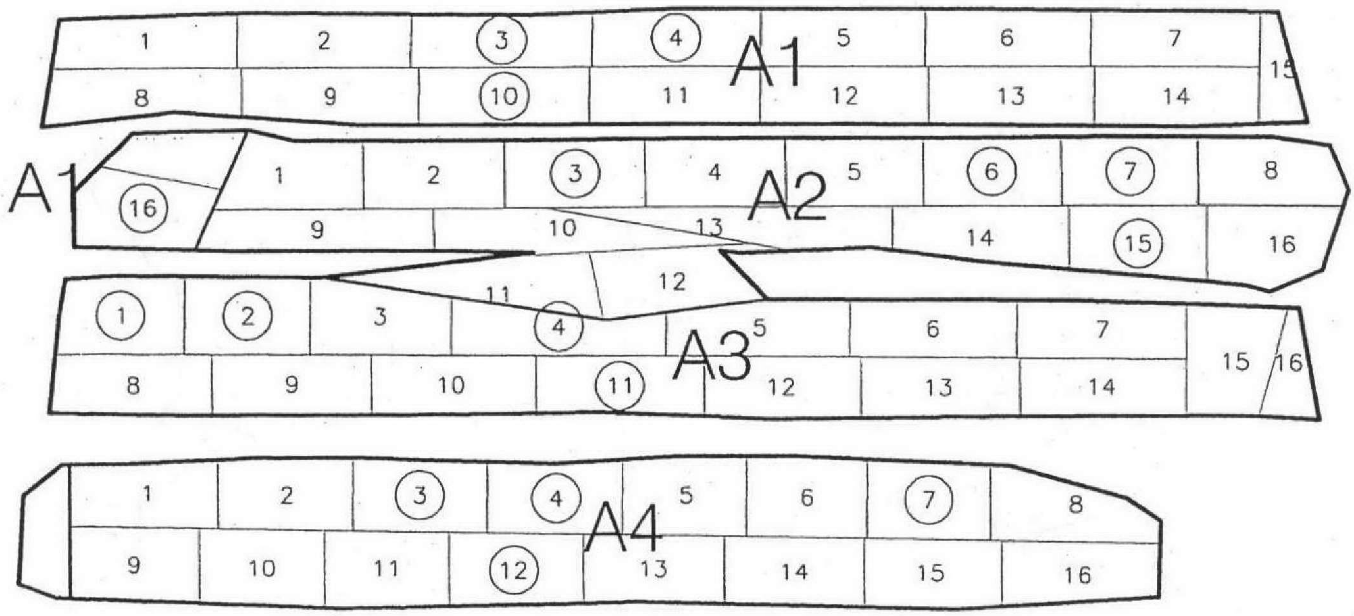
VERIFICATION SOIL SAMPLE RESULTS FOR TRITIUM

AREA 1 SAMPLING SUBUNIT



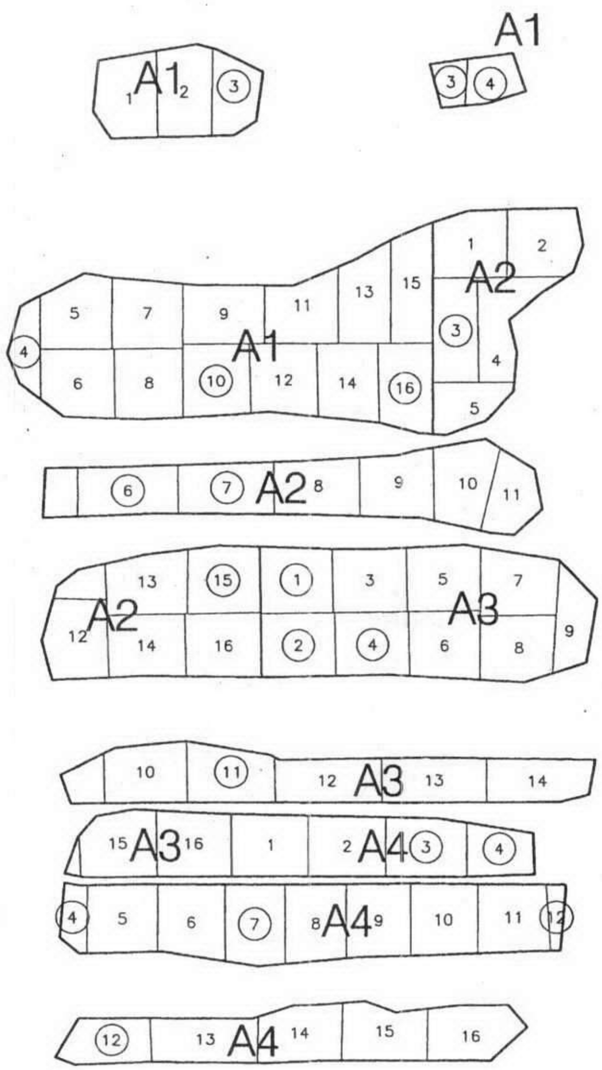
Sampling Area	Sample Number	Sample Date	Tritium Result		
			pCi/g	Q	MDA
A1	J12X44	7/19/2006	1.74	U	3.4
A1 duplicate	J12X48	7/19/2006	0.535	U	2.8
A2	J12X45	7/19/2006	239		2.8
A3	J12X46	7/20/2006	0.303	U	2.7
A4	J12X47	7/20/2006	0.574	U	3.1

AREA 2 SAMPLING SUBUNIT



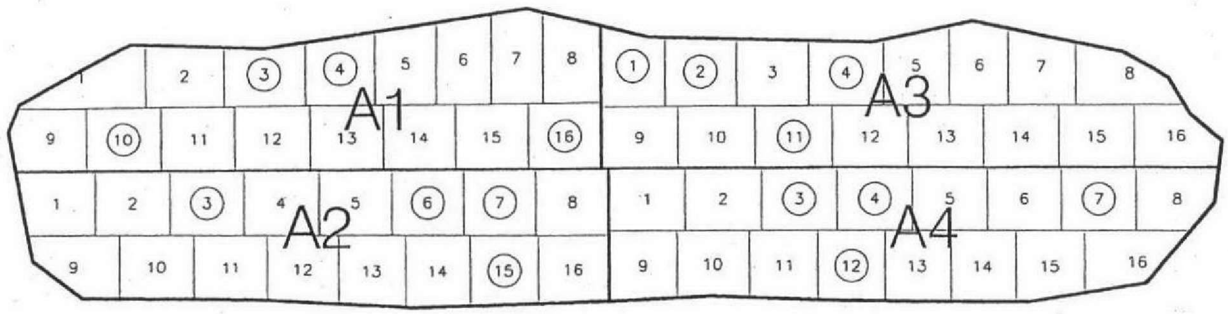
Sampling Area	Sample Number	Sample Date	Tritium Result		
			pCi/g	Q	MDA
A1	J12X50	7/20/2006	0.150	U	2.9
A2	J12X51	7/20/2006	59.6		2.8
A3	J12X52	7/20/2006	0.236	U	3.0
A4	J12X53	7/20/2006	-0.432	U	2.7

AREA 3 SAMPLING SUBUNIT



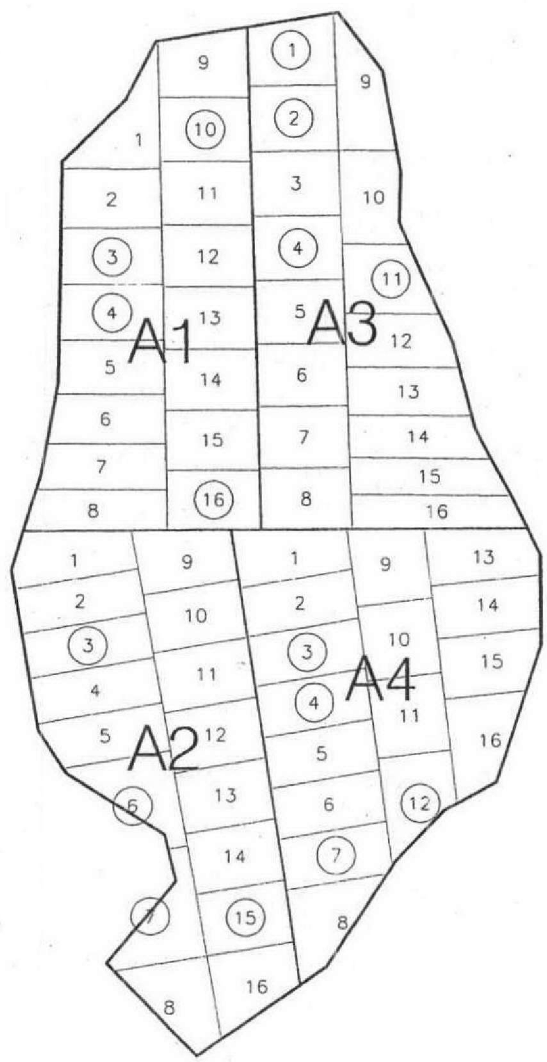
Sampling Area	Sample Number	Sample Date	Tritium Result		
			pCi/g	Q	MDA
A1	J12X54	7/20/2006	0.767	U	2.7
A2	J12X55	7/20/2006	0.759	U	2.6
A3	J12X56	7/20/2006	0.491	U	2.7
Duplicate	J12X58	7/20/2006	0.311	U	2.7
A4	J12X57	7/20/2006	19.0		2.6

AREA 4 SAMPLING SUBUNIT



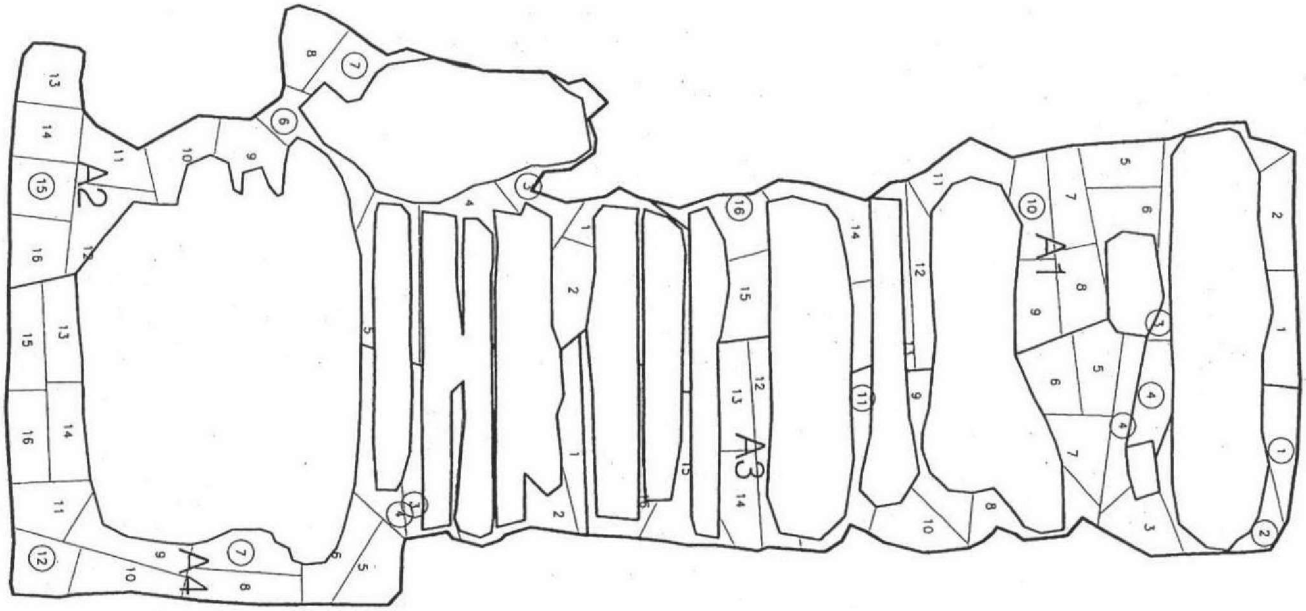
Sampling Area	Sample Number	Sample Date	Tritium Result		
			pCi/g	Q	MDA
A1	J12X61	7/25/2006	-0.056	U	3
Duplicate of J12X61	J12X65	7/25/2006	-0.936	U	3.1
A2	J12X62	7/25/2006	1.14	U	3.1
A3	J12X63	7/25/2006	-0.228	U	3.1
A4	J12X64	7/25/2006	-1.07	U	3.2

AREA 5 SAMPLING SUBUNIT



Sampling Area	Sample Number	Sample Date	Tritium Result		
			pCi/g	Q	MDA
A1	J13V12	12/7/2006	0.741	U	3.3
A2	J13V10	12/7/2006	2.18	U	3.5
A3	J13V13	12/7/2006	0.369	U	3.3
A4	J13V11	12/7/2006	1.70	U	3.3

AREA 6 SAMPLING SUBUNIT



Sampling Area	Sample Number	Sample Date	Tritium Result		
			pCi/g	Q	MDA
A1	J12XC2	7/25/2006	-1.11	U	3.1
A2	J12XC3	7/25/2006	-0.493	U	3.0
A3	J12XC4	7/25/2006	5.03		3.0
A4	J12XC5	7/25/2006	0.083	U	3.0

DISTRIBUTION

U.S. Department of Energy
Richland Operations Office

D. C. Smith	A3-04

Washington Closure Hanford

M. N. Brosee	H4-24
J. M. Capron	H4-23
R. A. Carlson	X4-08
S. W. Clark	H4-23
J. S. Decker	X4-08
L. A. Dietz	H4-22
L. M. Dittmer	H4-23
R. L. Donahoe	X4-08
S. L. Feaster	H4-24
K. A. Fecht	H4-21
E. T. Feist,	H4-22
J. W. Golden	X4-08
C. R. Martinez	X3-40
C. G. Spencer	H4-24
D. A. St. John (2)	H4-21
D. N. Strom (2)	X3-40
W. S. Thompson (3)	H4-23
Document Control	H4-11
DOE-RL Public Reading Room	H2-53
Hanford Technical Library	P8-55